

*On the Propagation and Metamorphoses of the Suctorial Crustacea of the Family Cymothoadæ.* By M. SCHLÖDTE.

Having been enabled, by the liberality of the directors, to bring together all the Cymothoadæ existing in the principal zoological museums of Scandinavia and Germany, I propose, with the collaboration of Dr. Meinert, Assistant Naturalist at the Museum of Copenhagen, to publish an extensive memoir on the natural history of those Crustaceans, including their biology, their morphology, and the description of their genera and species. MM. Milne-Edwards and Heinrich Rathke were the first to make known the young stages of several Cymothoadæ; nevertheless the study of these marine animals has furnished us with new facts of general interest upon the subject of their metamorphoses. In my own name and that of Dr. Meinert I have the honour to communicate them to the Academy.

When the young issue from the ovum in the oviferous pouch of the female they are perfectly smooth; the antennæ of the first pair have no olfactory threads; the antennæ of the second pair, the last segment of the tail, the feet, and the branchiæ are entirely destitute of natatory cilia. It is during the first moult, which takes place before the little animal has quitted the maternal oviferous pouch, that all these parts are developed. At the same time we observe more or less considerable changes in the form of the young animal, and in the configuration of its appendages, especially of the tail—changes which all tend towards the same end, namely to convert the creeping animal of the first stage into a swimming animal. The subsequent changes which take place during a long series of moults in the little Cymothoad swimming freely in the sea, where it derives its nourishment from the blood or the mucus of fishes, render it more and more fitted for rapid natation, at the same time that the constantly advancing progress of development enables it to attach itself better to the bodies of fishes. It is at this period of free natation that the feet of the seventh pair are developed; the epimera of these feet, which are wanting in young specimens before the second moult, begin to separate themselves from the seventh segment of the body. Up to the fourth moult the feet of the last pair, which are completely smooth, increase in size, remaining applied beneath the ventral surface and directed inwards, in such a manner that one cannot see them when looking at the animal from above. During this period the ventral surface of the females remains entirely plain, without traces of the sexual orifices and oviferous pouch; in the males, on the contrary, the corresponding orifices become more and more visible on the ventral arch of the seventh segment of the body as soon as the feet of the last pair have attained perfection.

When arrived at the adult state, the individuals of the two sexes retire to copulate. The *errant suctorial Cymothoadæ* seek a shelter in the depths of the sea. The females of many *parasitic Cymothoadæ* attach themselves strongly to the skin or fins of fishes; others penetrate into the branchial or buccal cavity of those animals—the latter hooking themselves firmly on to the surface of the tongue,

with the head directed forwards towards the opening of the mouth of the fish. Usually one male keeps beside the female; sometimes several males are met with near a single female.

The moults take place in all these Crustacea in a peculiar manner. The skin first of all quits the hinder part of the body, the animal remaining strongly attached by the front legs; the anterior part of the body is disengaged in its turn in the same manner, the animal being then attached by the new claws of the hinder feet. This mode of changing the skin is an absolutely necessary condition for the copulation. In fact, the act would become impossible if the oviferous pouch of the female were formed at once beneath all the segments of the body, thus stopping the sexual orifices, which are formed at the same time towards the sides of the ventral arch of the fifth segment. But the oviferous pouch, half-formed after the moult of the posterior part of the body, having as yet only three lamellæ, which are attached to the last three segments of the body, remains broadly open in front; and the male can easily make his way into it. After copulation, the female, changing the skin of her anterior part, at the same time completes the oviferous pouch with the lamellæ belonging to that region of the body. It is to be remarked that the anterior lamellæ of the oviferous pouch cover the jaw-feet and often the mouth itself—an arrangement which proves that the female now takes scarcely any more nourishment. The lamellæ being directed forward, it is in this direction beneath the head that the young issue from the oviferous pouch after their first moult. The female remaining attached and motionless during the deposition of the ova, dies flaccid and empty after the escape of the young.

In many of these Crustaceans, especially in the errant suctorial Cymothoadae, the young are very large in proportion to the adult animal, and, to make up for this, are not very numerous; in others, on the contrary, the young, to the number of a couple of thousand, are of extreme minuteness. As a matter of course, these proportions are in direct relation with the greater or less difficulties which the young must encounter during their evolutive life, according to the mode of life of the different fishes to which they attach themselves. In the young the configuration and the relative size of the head, antennæ, eyes, and the last segment of the tail and its appendages, and the number, form, and distribution of the pigment spots, present a multitude of differences according to the species. The claws, which are always simple and but slightly curved before the first moult, often become strongly serrate after this moult—a structure which is gradually lost during the following moults. All these differences during youth frequently become a great assistance in the specific distinction of the adult animals, especially when the latter, as is the case in a great proportion of the parasitic Cymothoadae, have undergone a retrograde metamorphosis as they increased in age. The females, converted into a more or less shapeless oviferous sac, lose to a great extent the symmetry and the definite form which distinguished their different appendages during the natatory stage of their life. Even in the errant suctorial Cymothoadae the

female undergoes considerable changes in becoming oviferous: the segments of the body shorten; the first segment of the tail becomes more or less completely hidden beneath the seventh segment of the body; &c. These differences often deceptively simulate zoological characters.—*Comptes Rendus*, July 8, 1878, p. 52.

*On Avenardia Priei, a Gigantic Nemertean of the West Coast of France.* By M. A. GIARD.

The Nemertean which forms the subject of this note measures as much as 1 metre or even 1·20 metre in length when in a state of repose; when it extends itself its length may become three or four times as much. Its breadth attains 2 or 3 centims.; and the general form of the body is flattened. In the contracted state the lateral margins often appear undulated or notched, as is observed also in the *Tœnia* and *Ligule*.

This worm is met with by hundreds at Pouliguen (Loire-Inférieure), but in a peculiar station—namely, in an old canal (*étier*) of the salt marshes, now converted into a reservoir, in which the seawater is renewed every tide. The water of this reservoir serves to set in motion the wheels of an establishment managed by M. Avenard. The workmen here have been acquainted with this enormous Nemertean for a number of years. They meet with it, at a depth of from 10 to 20 centims. in the mud, whenever they clean out a portion of the reservoir. The salters, whom I have asked about it, have not observed it any where else in the salt marshes. It is equally unknown to the fishermen of the port of Pouliguen, as also to those of Croisie.

The principal animals which inhabit the mud of the reservoir are several species of Nereids (one of which is peculiar to brackish waters), *Pholades* (*P. ductylus* and *P. candida*), *Scrobiculariæ*, flat-fishes, and eels. Oysters, which have lately been introduced into the reservoir, thrive there remarkably. The thousands of Nemerteans extracted from the mud during cleansing-operations are devoured with avidity by domestic ducks.

The Nemertean hollows out in the mud long galleries, which it lines with a mucous coating, so that no earthy particle can soil its epidermis. When put into the water it swims with the greatest facility, by performing undulatory movements, giving it an astonishing resemblance to an eel. Its colour, moreover, sufficiently resembles that of this fish: the back is of a more or less dark blackish grey, and quite black along the median line; the belly is entirely white or yellowish white.

When taken out of the water, instead of stretching softly, like *Lineus longissimus*, the animal breaks up very rapidly into a multitude of fragments, which become smaller and smaller. When the division stops, the fragments are scarcely more than 2 centims. long; and each of them has acquired a rounded form, in consequence of the contraction of the muscles, which gradually diminishes the open surface of the section, and finally causes it to disappear entirely. To obtain an entire specimen the most certain method is to throw